APL5522



Dual-Channel, 3.3V/500mA and 2.5V/500mA Linear Regulator

Features

- **Fixed Output Voltage :**
  V_{OUT1}=3.3V/500mA (within Maximum Power Dissipation)
  V_{OUT2}=2.5V/500mA (within Maximum Power Dissipation)
- **Low Dropout Voltage (Defined as the Minimum Input/Output Voltage Difference):**
  Output 1 Dropout Voltage : 550mV (at 500mA)
  Output 2 Dropout Voltage : 630mV (at 500mA)
- **Stable with 4.7mF Output Capacitor(at V_{OUT1})**
  Stable with 4.7mF Output Capacitor(at V_{OUT2})
- **No Protection Diodes Needed**
- **Built-In Thermal Protection**
- **Built-In Current-Limit Protection**
- **Fast transient Response**
- **Short Setting Time**
- **SOP-8 and SOP-8P Packages Available**
- **Lead Free and Green Devices Available (RoHS Compliant)**

Applications

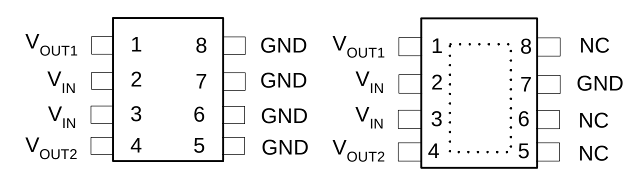
- **Desktop Computer**
- **Networking Systems**
- **Optical Data Storage Systems**

General Description

The APL5522 is a dual low dropout regulator with output 1 with 3.3V/0.5A and output2 with 2.5V/0.5A output capability. In order to obtain lower dropout voltage and faster transient response, which is critical for low voltage applications, the APL5522 has been optimized. V_{OUT1} typical dropout voltage is 550mV at 500mA loading and V_{OUT2} typical dropout voltage is 630mV at 500mA loading. Current limit is trimmed to ensure specified output current and controlled short-circuit current. On-chip thermal limiting provides protection against any combination of overload that would create excessive junction temperatures. The APL5522 regulator comes in a SOP-8 and SOP-8P packages.

Pin Configuration

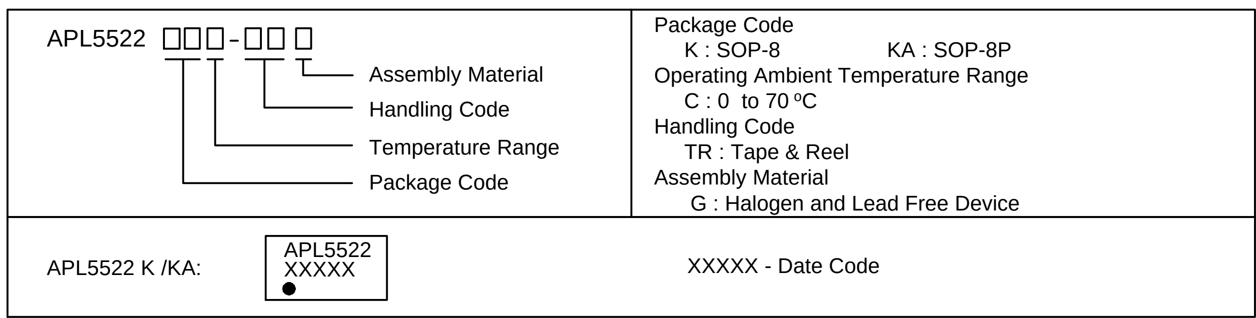
SOP-8 Top View **SOP-8P Top View**



= Thermal Pad
(The thermal pad of SOP-8P has to be connected to the GND plane to get better heat dissipation than SOP-8.)



Ordering and Marking Information



APL5522 K /KA:	APL5522 XXXXX ●	XXXXX - Date Code

Note: ANPEC lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. ANPEC lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020C for MSL classification at lead-free peak reflow temperature. ANPEC defines "Green" to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

Absolute Maximum Ratings (Note 1)

Symbol	Parameter	Rating	Unit
V_{IN}, V_{OUT}	Input Voltage or Out Voltage	6	V
P_D	Power Dissipation	Internally Limited	W
T_J	Operating Junction Temperature	0 to 150	°C
T_{STG}	Storage Temperature Range	-65 to +150	°C
T_L	Maximum Lead Soldering Temperature, 10 Seconds	260	°C

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Thermal Characteristics

Symbol	Parameter	Typical Value	Unit
$R_{TH,JA}$	Thermal Resistance – Junction to Ambient SOP-8 SOP-8P	120 65	°C/W
$R_{TH,JC}$	Thermal Resistance – Junction to Case SOP-8 SOP-8P	30 5	°C/W

Electrical Characteristics

Unless otherwise noted these specifications apply over full temperature, C_{IN}=1μF, C_{OUT1}=C_{OUT2}=4.7μF, T_J=0 to 150°C. Typical values refer to T_J=25°C.

Symbol	Parameter	Test Conditions	APL5522			Unit
			Min.	Typ.	Max.	
V_{IN}	Input Voltage		2.7	-	6	V
I_{SHORT}	Short Current	V_{OUT}=0V	-	50	-	mA
PSRR	Ripple Rejection	F≤1kHz, 1Vpp at V_{IN} = V_{OUT}+1.0V C_{OUT}=10nf	45	55	-	dB



Electrical Characteristics (Cont.)

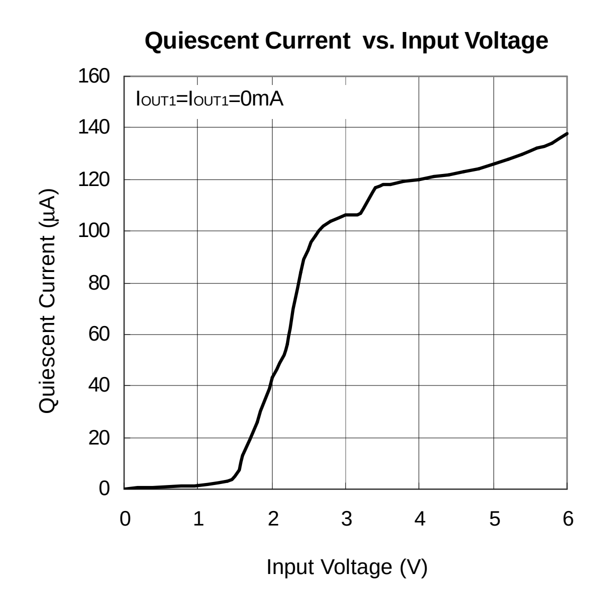
Unless otherwise noted these specifications apply over full temperature, C_{IN}=1μF, C_{OUT1}=C_{OUT2}=4.7μF, T_J=0 to 150°C. Typical values refer to T_J=25°C.

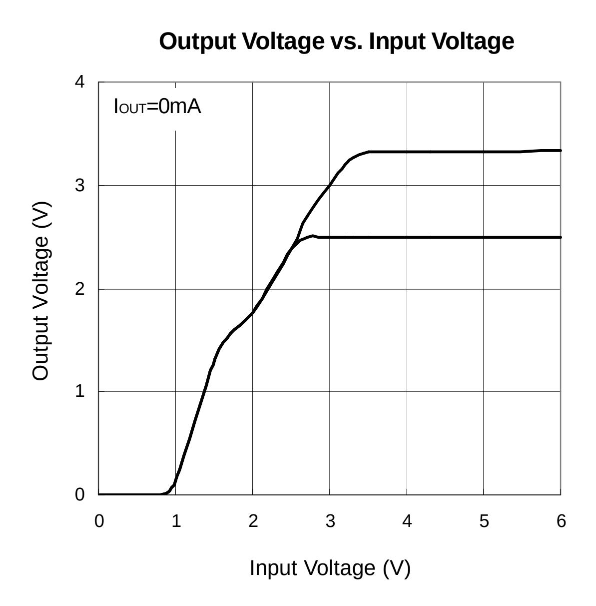
Symbol	Parameter	Test Conditions	APL5522			Unit
			Min.	Typ.	Max.	
I_Q	Quiescent Current	I_{OUT1}=300mA, I_{OUT2}=300mA	-	900	1000	μA
		I_{OUT1}=0mA, I_{OUT2}=0mA	-	100	200	
OUTPUT1 (500mA)						
V_{OUT}	Output Voltage	V_{OUT}+1.0V< V_{CC}<6.0V, 0mA< I_{OUT} < I_{MAX}	V_{OUT} -2%	3.3	V_{OUT} +2%	V
I_{LIMIT}	Circuit Current Limit	V_{IN}=V_{OUT}+1V	-	800	-	mA
I_{OUT}	Load Current	V_{IN}=V_{OUT}+1V	500	-	-	mA
REG_{LINE}	Line Regulation	V_{OUT}+1V< V_{CC}<6.0V, I_{OUT}=1mA	-	4	10	mV
REG_{LOAD}	Load Regulation	V_{IN} =V_{OUT}+1V, 0mA< I_{OUT} < I_{MAX}	-	26	40	mV %
	Load Transient	V_{IN}= V_{OUT}+1V, I_{OUT}=1mA-500mA in 1μs	-	150	250	mV
V_{DROP}	Dropout Voltage (Note2)	I_{OUT} =500mA	-	0.6	0.7	V
C_{OUT}	Output Capacitor		-	4.7	-	μF
	ESR		0.01	0.1	1	Ohm
OUTPUT2 (500mA)						
V_{OUT}	Output Voltage	V_{OUT}+1.0V< V_{CC}<6.0V, 0mA< I_{OUT} < I_{MAX}	V_{OUT} -2%	2.5	V_{OUT} +2%	V
I_{LIMIT}	Circuit Current Limit	V_{IN}=V_{OUT}+1V	-	800	-	mA
I_{OUT}	Load Current	V_{IN}=V_{OUT}+1V	500	-	-	mA
REG_{LINE}	Line Regulation	V_{OUT}+1V< V_{CC}<6.0V, I_{OUT}=1mA	-	4	10	mV
REG_{LOAD}	Load Regulation	V_{IN} =V_{OUT}+1V, 0mA< I_{OUT} < I_{MAX}	-	26	40	mV %
	Load Transient	V_{IN}= V_{OUT}+1V, I_{OUT}=1mA-500mA in 1μs	-	150	250	mV
V_{DROP}	Dropout Voltage (Note2)	I_{OUT} =500mA	-	0.6	0.7	V
C_{OUT}	Output Capacitor		-	4.7	-	μF
	ESR		0.01	0.1	1	Ohm

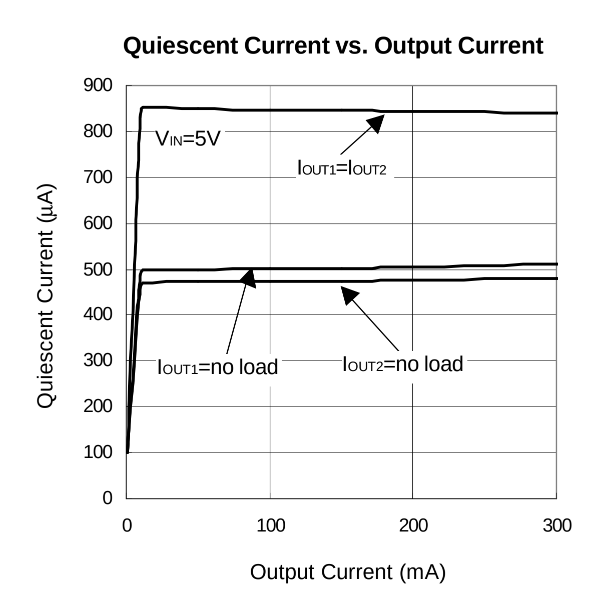
Note 2 : Dropout voltage definition : V_{IN}-V_{OUT} when V_{OUT} is 2% below the value of V_{OUT} for V_{IN} = V_{OUT}+1V

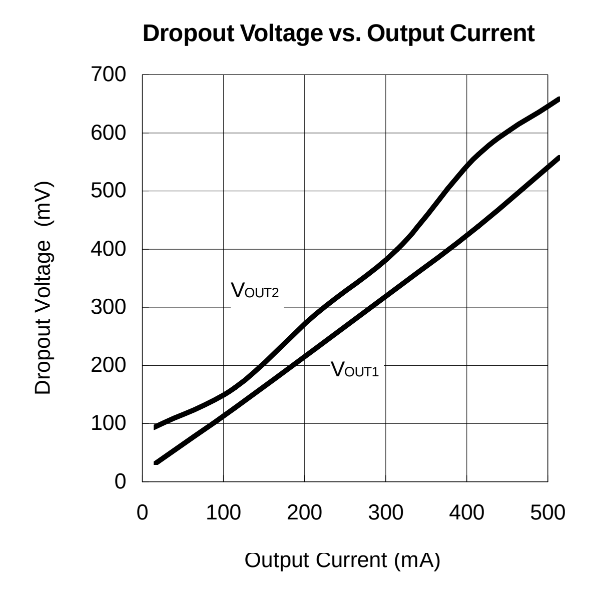


Typical Operating Characteristics





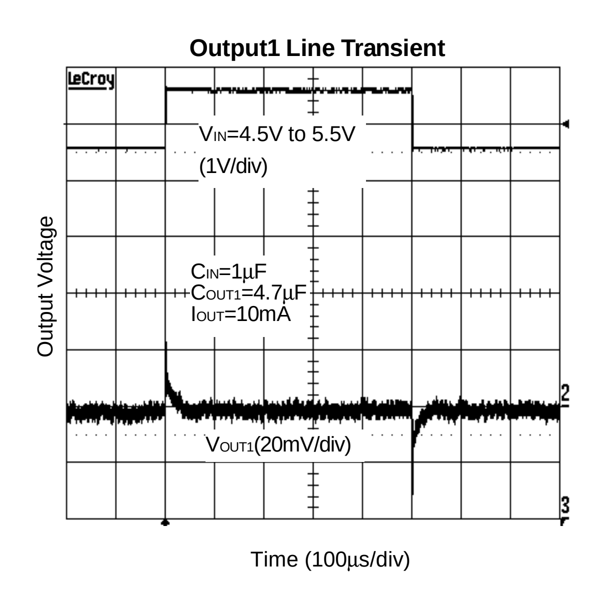




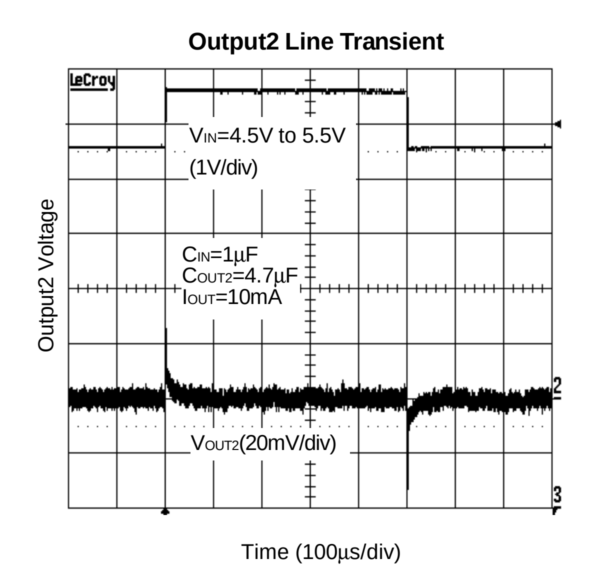


Typical Operating Characteristics (Cont.)

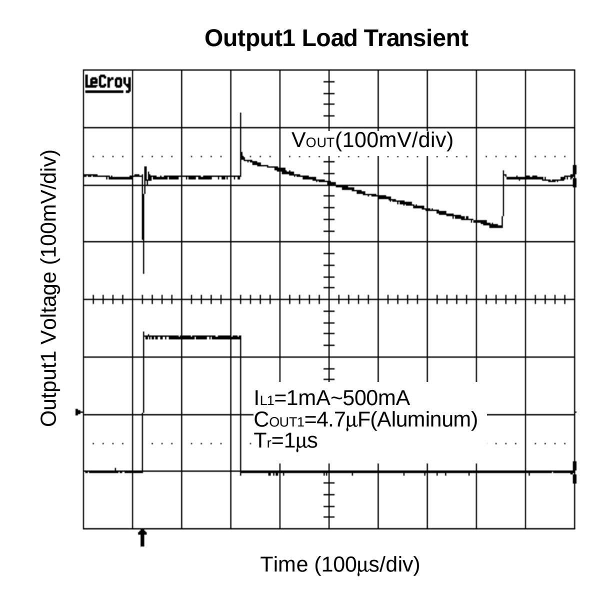
Output1 Line Transient



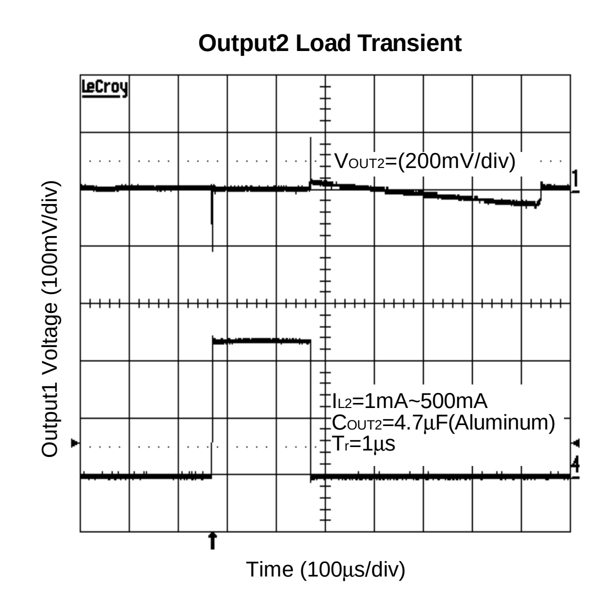
Output2 Line Transient



Output1 Load Transient

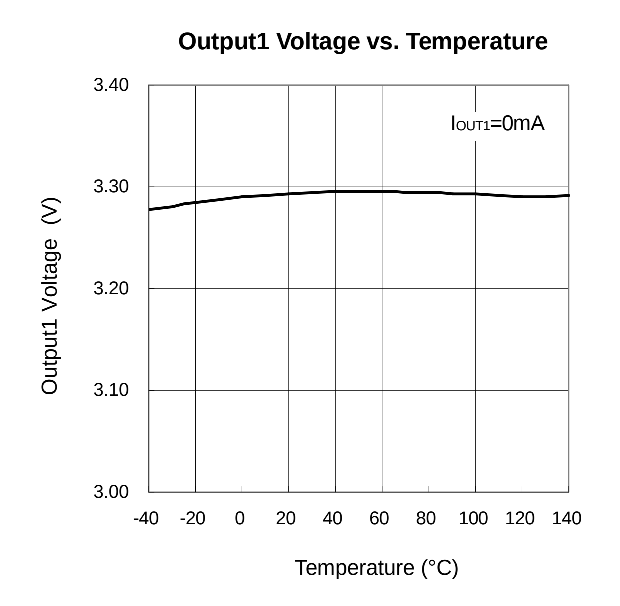


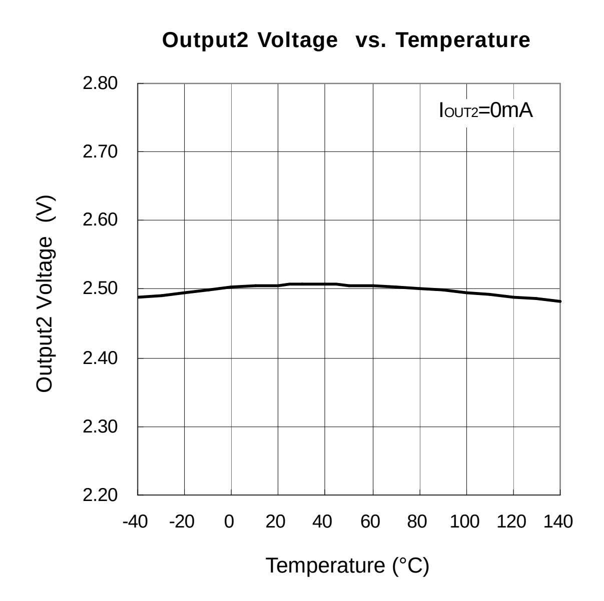
Output2 Load Transient

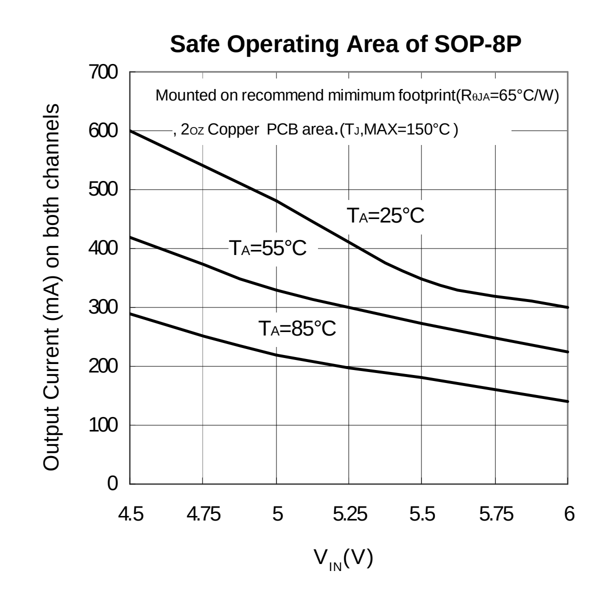


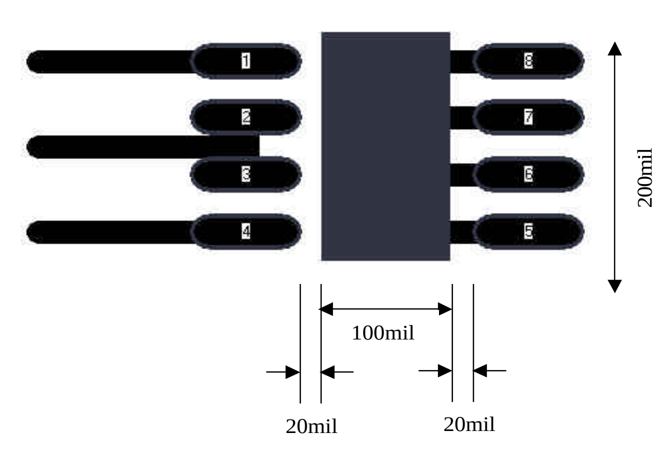


Typical Operating Characteristics (Cont.)







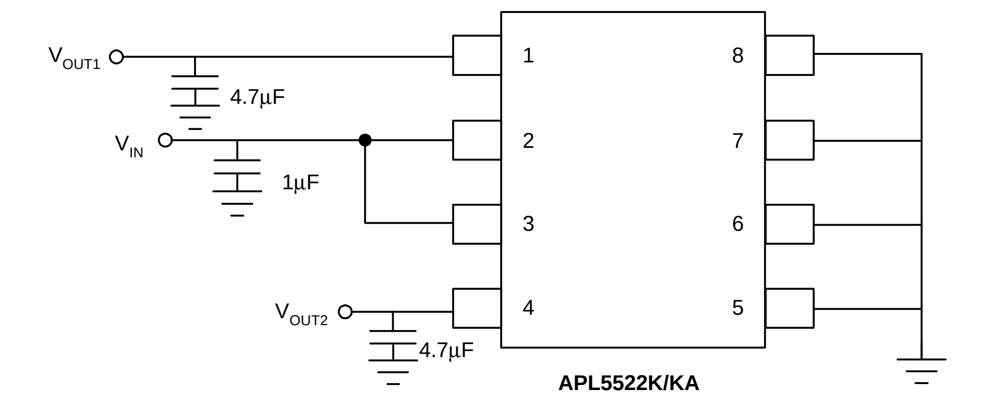




Pin Description

PIN		I/O	FUNCTION
NO.	NAME		
1	V_{OUT1}	O	V_{OUT1} output Voltage 3.3V. sources up to 500 mA.
2	V_{IN}	I	Supply Voltage. Voltage can range from 4V to 6V
3	V_{IN}	I	Supply Voltage. Voltage can range from 4V to 6V
4	V_{OUT2}	O	V_{OUT2} output Voltage 2.5V. sources up to 500 mA.
5	GND		Ground also functions as a heatsink. Solder to the ground plane to maximize thermal dissipation
6	GND		
7	GND		
8	GND		

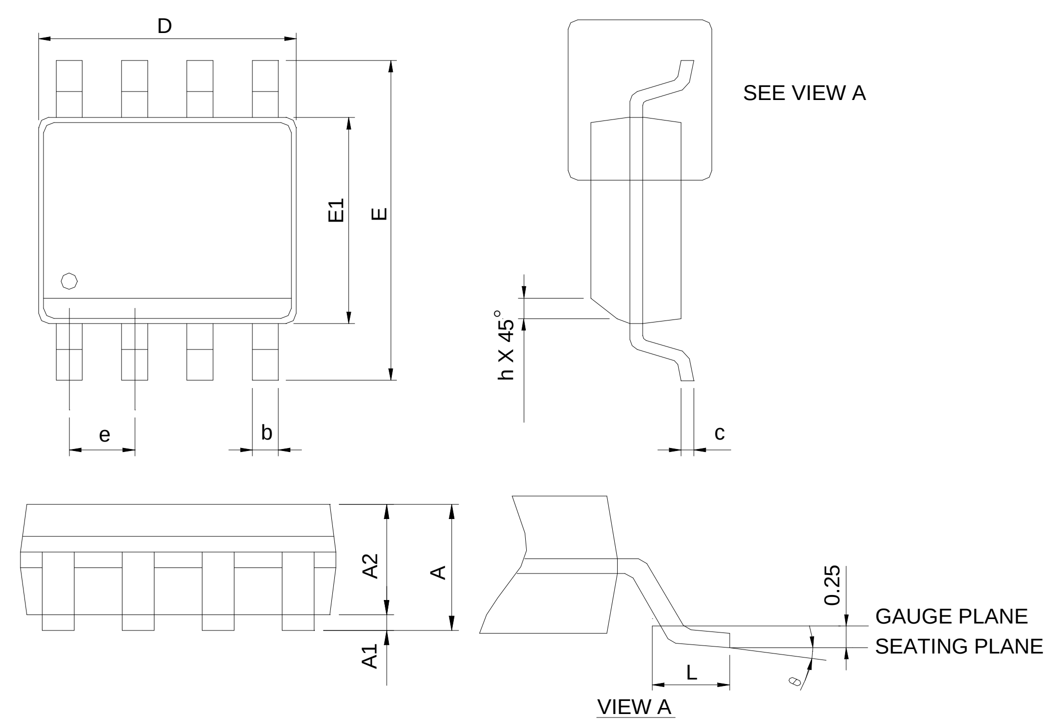
Typical Application Circuit





Package Information

SOP-8



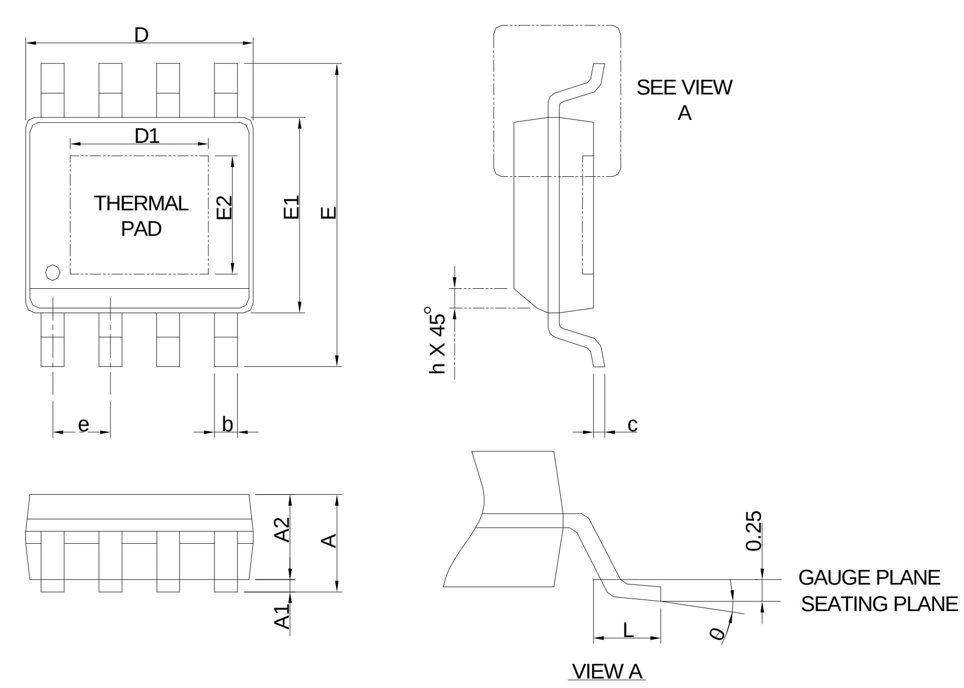
SYMBOL	SOP-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		1.75		0.069
A1	0.10	0.25	0.004	0.010
A2	1.25		0.049	
b	0.31	0.51	0.012	0.020
c	0.17	0.25	0.007	0.010
D	4.80	5.00	0.189	0.197
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
h	0.25	0.50	0.010	0.020
L	0.40	1.27	0.016	0.050
θ	0°	8°	0°	8°

Note: 1. Follow JEDEC MS-012 AA.
2. Dimension “D” does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.
3. Dimension “E” does not include inter-lead flash or protrusions. Inter-lead flash and protrusions shall not exceed 10 mil per side.



Package Information

SOP-8P



SYMBOL	SOP-8P			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		1.60		0.063
A1	0.00	0.15	0.000	0.006
A2	1.25		0.049	
b	0.31	0.51	0.012	0.020
c	0.17	0.25	0.007	0.010
D	4.80	5.00	0.189	0.197
D1	2.25	3.50	0.098	0.138
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
E2	2.00	3.00	0.079	0.118
e	1.27 BSC		0.050 BSC	
h	0.25	0.50	0.010	0.020
L	0.40	1.27	0.016	0.050
θ	0°	8°	0°	8°

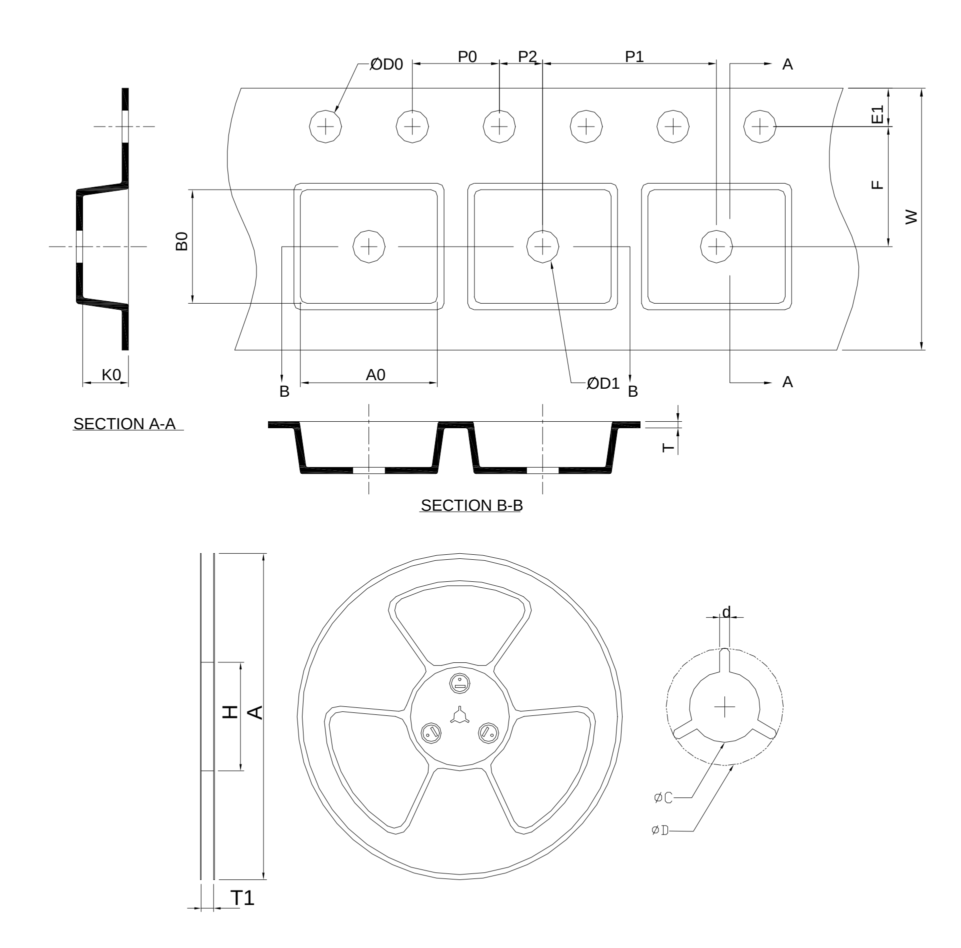
Note : 1. Follow JEDEC MS-012 BA.

2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side .

3. Dimension "E" does not include inter-lead flash or protrusions. Inter-lead flash and protrusions shall not exceed 10 mil per side.



Carrier Tape & Reel Dimensions



Application	A	H	T1	C	d	D	W	E1	F
SOP-8(P)	330.0±2.00	50 MIN.	12.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	12.0±0.30	1.75±0.10	5.5±0.05
	P0	**P1**	**P2**	**D0**	**D1**	**T**	**A0**	**B0**	**K0**
	4.0±0.10	8.0±0.10	2.0±0.05	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	6.40±0.20	5.20±0.20	2.10±0.20

(mm)

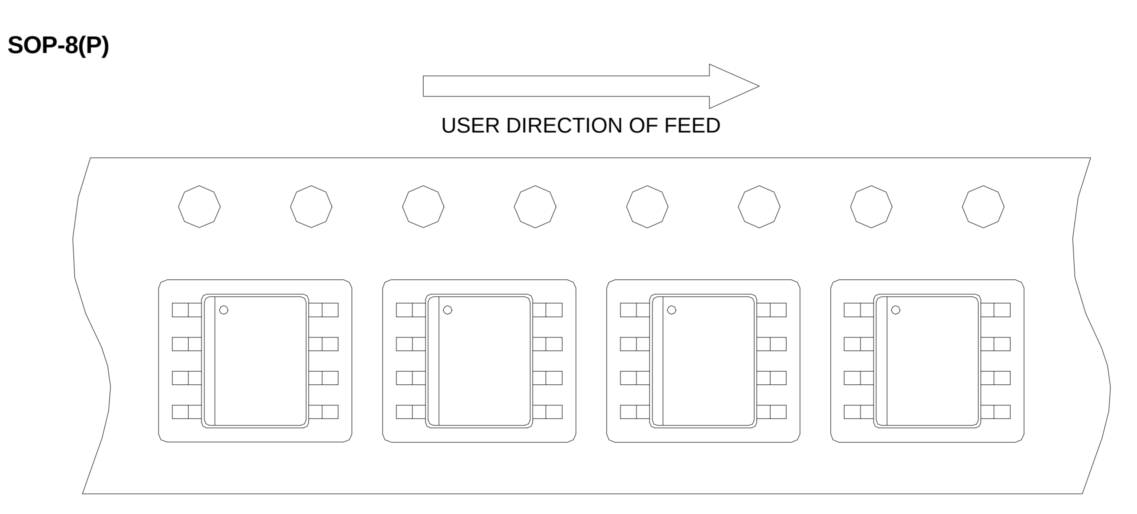
Devices Per Unit

Package Type	Unit	Quantity
SOP-8(P)	Tape & Reel	2500

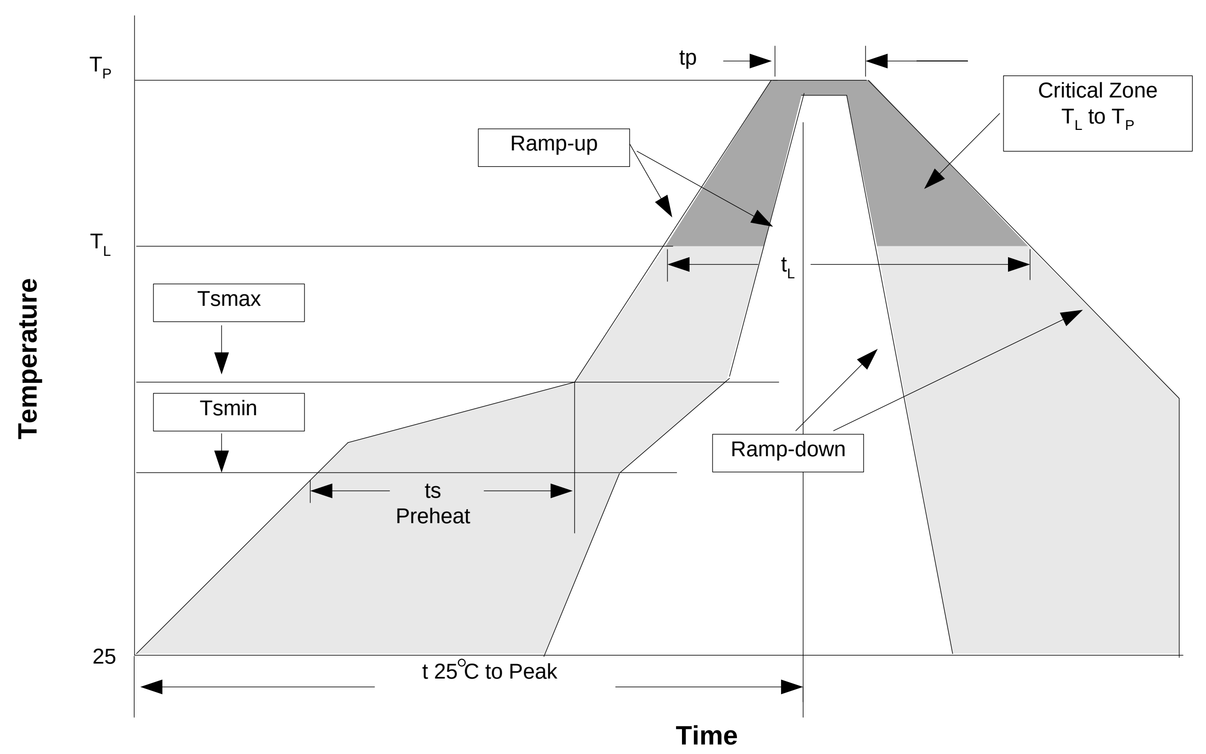


Taping Direction Information

SOP-8(P)



Reflow Condition (IR/Convection or VPR Reflow)



Reliability Test Program

Test item	Method	Description
SOLDERABILITY	MIL-STD-883D-2003	245°C, 5 sec
HOLT	MIL-STD-883D-1005.7	1000 Hrs Bias @125°C
PCT	JESD-22-B,A102	168 Hrs, 100%RH, 121°C
TST	MIL-STD-883D-1011.9	-65°C~150°C, 200 Cycles
ESD	MIL-STD-883D-3015.7	VHBM > 2KV, VMM > 200V
Latch-Up	JESD 78	10ms, 1_{tr} > 100mA



Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	3°C/second max.	3°C/second max.
Preheat - Temperature Min (Tsmin) - Temperature Max (Tsmax) - Time (min to max) (ts)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: - Temperature (T_L) - Time (t_L)	183°C 60-150 seconds	217°C 60-150 seconds
Peak/Classification Temperature (Tp)	See table 1	See table 2
Time within 5°C of actual Peak Temperature (tp)	10-30 seconds	20-40 seconds
Ramp-down Rate	6°C/second max.	6°C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

Notes: All temperatures refer to topside of the package. Measured on the body surface.

Table 1. SnPb Eutectic Process – Package Peak Reflow Temperatures

Package Thickness	Volume mm^3 <350	Volume mm^3 ^{3}350
<2.5 mm	240 +0/-5°C	225 +0/-5°C
≥2.5 mm	225 +0/-5°C	225 +0/-5°C

Table 2. Pb-free Process – Package Classification Reflow Temperatures

Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
<1.6 mm	260 +0°C*	260 +0°C*	260 +0°C*
1.6 mm – 2.5 mm	260 +0°C*	250 +0°C*	245 +0°C*
≥2.5 mm	250 +0°C*	245 +0°C*	245 +0°C*

* Tolerance: The device manufacturer/supplier **shall** assure process compatibility up to and including the stated classification temperature (this means Peak reflow temperature +0°C. For example 260°C+0°C) at the rated MSL level.

Customer Service

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